

REMARKS

Reconsideration and allowance of the present application are respectfully requested in view of the foregoing amendments and the following remarks. Claims 1, 2, 4, 5, 10-12, 14, 17, 20, and 22 are amended, and claims 6-9, 16, 18, 19, and 21 are cancelled. Claims 23-30 are added. Claims 1-5, 10-15, 17, 20, and 23-30 are pending.

Exemplary Embodiments

Exemplary embodiments of the disclosure include methods for carrying out surface plasmon resonance measurement. For example, as illustrated in Fig. 2, a beam 1 of electromagnetic radiation can be produced by a source 2 of electromagnetic radiation. The beam 1 of electromagnetic radiation can be directed through a prism 3 onto a material layer 5 in an angle of incidence, which material layer 5 at least partly covers a planar surface 4 of the prism. A surface plasmon resonance (SPR) phenomenon can be caused. In the exemplary methods, a beam 6 of reflected electromagnetic radiation can be produced and directed by the surface 4 through the prism 3 and further to a detector 7 for detecting the level of intensity of the beam 6 of reflected electromagnetic radiation. The change of intensity of the beam 6 of reflected electromagnetic radiation, caused by the surface resonance phenomenon, can be measured. The beam 6 of reflected electromagnetic radiation can be reflected with a mirror 8 to the detector 7.

In at least one exemplary embodiment, the angle of incidence can be varied to cause the surface plasmon resonance phenomenon by

- i) rotating the prism 3 and the mirror 8 together with respect to the source 2 of electromagnetic radiation and the detector 7.

In at least one exemplary embodiment, the angle of incidence can be varied to cause the surface plasmon resonance phenomenon by

ii) rotating the source 2 of electromagnetic radiation and the detector 7 together with respect to the prism 3 and the mirror 8.

The embodiments of i) and ii) above are not necessarily mutually exclusive from each other and may be implemented in the alternative or in concert.

Independent claims 1 and 11 and new independent claims 25 and 26 broadly recite features of the above-described embodiments.

Rejections Under 35 U.S.C. §103(a)

Claims 1-4 and 11-14 were rejected under 35 U.S.C. §103(a), as allegedly being unpatentable over Quinn et al. (U.S. Patent Application Publication No. 2003/0103208, hereafter "Quinn") in view of Nikitin (U.S. Patent No. 6,628,376, hereafter "Nikitin").

Claims 5, 6, 9 and 15 were rejected under 35 U.S.C. §103(a), as allegedly being unpatentable over Quinn in view of Nikitin and further in view of Maule (U.S. Patent No. 5,415,842, hereafter "Maule").

Claims 6-10 and 16-22 were rejected under 35 U.S.C. §103(a), as allegedly being unpatentable over Quinn in view of Nikitin and further in view of Johansen (U.S. Patent Application Publication No. 2003/0048452, hereafter "Johansen").

Independent claims 1 and 11 have been amended to recite features related to cancelled claims 6 and 8. For example, claim 1 recites, in part, that the angle of incidence is varied to cause the surface plasmon resonance phenomenon by at least one of:

- i) rotating the prism and the mirror together with respect to the source of electromagnetic radiation and the detector, and
- ii) rotating the source of electromagnetic radiation and the detector together with respect to the prism and the mirror.

The rejection based on the two documents of Quinn and Nikitin is believed to be moot because Quinn and Nikitin, whether alone or in the combination alleged by the Examiner, do not disclose or suggest the rotation(s) as recited in independent claim 1. The Examiner has tacitly conceded this point by relying on Maule and/or Johansen in an attempt to arrive at the subject matter of cancelled claim 6.

The addition of Maule does not cure the deficiencies of Quinn and Nikitin. The rejection of claim 6 in view of Maule is believed to be a typographical error because the Examiner has not indicated features of claim 6 that can correspond to any of Quinn, Maule, and Nikitin. Maule, like Quinn and Nikitin, does not disclose or suggest the rotation(s) as recited in cancelled claim 6 nor the rotation(s) as recited in amended claim 1.

In numbered section 7 of page 6 of the Office Action, the Examiner states that Quinn and Nikitin do not disclose a prism and mirror being rotated together with respect to a source of electromagnetic radiation and the detector so that the angle of incidence varies to achieve a surface plasmon resonance phenomenon. The Examiner asserts that it would have been obvious to add Johansen in an attempt to remedy the deficiencies of Quinn and Nikitin. This assertion is unsupportable.

Quinn discloses a portable SPR sensor 30 which includes an electromagnetic radiation source 32 for generating a beam of electromagnetic radiation 52. The radiation beam 52 passes through a liquid crystal switch toward a layer 44 where it is

first reflected to a mirror 46, which then reflects the already reflected beam to detectors 48.

Johansen discloses a two-dimensional imaging SPR apparatus. As illustrated in Fig. 7 and described in paragraph 73 of Johansen, the SPR apparatus includes an illumination system 100 which outputs a light beam 110 toward a prism 210 of a sensor unit 200 at an angle. The reflected light from the sensor unit 200 is projected on an imaging system 500.

There appears to be two different versions of rotation disclosed in paragraph 73 of Johansen. In the first version, the light beam 110 is altered by rotating the illumination system 100 with respect to the prism 210 with imaging system 500 being rotated the same amount as the prism 210, but in the other direction. In the second version, the rotation can be performed by a goniometer, i.e. a θ , 2θ system, where the illuminating system 100 is fixed and the prism is rotated θ and the imaging system 500 is rotated 2θ . In both versions, the separate rotation can require a complex mechanical solution because illumination system 100, prism 210, and imaging system 500 are rotated at different angles with respect to each other.

The second version of Johansen is similar to an arrangement shown in Fig. 1 and page 1, line 26-page 3, line 5 of the specification. In this arrangement, in order to collect a beam 1 of electromagnetic radiation produced by the source 2 and reflected as a beam 6 of electromagnetic radiation by the surface 4, the detector 7 has therefore to be rotated at an angle γ , which is twice the angle β of the rotation of the prism itself in the arrangement shown in figure 1.

Both versions cannot be combined with Quinn and Nikitin to result in the method of claim 1.

In numbered section 7 of page 6 of the Office Action, the Examiner states that Johansen discloses a prism and mirror being rotated, pointing to paragraph 73 of Johansen, but Johansen does not disclose a mirror, as recited in claim 1. The Examiner relies on Quinn as allegedly disclosing the mirror. However, because Johansen does not disclose a mirror, it is unknown how Johansen might rotate the mirror 46 of Quinn, if at all. There is no disclosure or suggestion in either Quinn or Johansen for rotation of a mirror.

The Examiner appears to indicate that source 32, layer 44, and detectors 48 of Quinn can be rotated in the manner of illumination system 100, the prism 210, and the imaging system 500, respectively, of Johansen. In Johansen, each of the illumination system 100, the prism 210 (part of sensor unit 200), and the imaging system 500 are positioned at certain angles described above, so the angle of the position of the mirror in the alleged combination is indeterminate. In addition, because of the different configuration of Quinn (e.g. the presence of a mirror 46), adding the rotation of Johansen to Quinn would result in a failed system because Johansen does not expect the mirror. As a result, the beam could not be reflected to the detectors 48. Even if the beam was reflected to the mirror 46, the mirror could reflect the beam away from the detectors 48 and cause the SPR device not to function.

In addition, claim 1 recites, in part, that the angle of incidence is varied to cause the surface plasmon resonance phenomenon by at least one of (i) rotating the prism and the mirror together with respect to the source of electromagnetic radiation and the detector, and (ii) rotating the source of electromagnetic radiation and the detector together with respect to the prism and the mirror. The illumination system

100, the prism 210, and the imaging system 500 of Johansen are rotated each to different angles, so they cannot be considered to be rotated together, in contrast to claim 1.

Nikitin does not remedy the deficiencies of the combination of Johansen and Quinn to arrive at all of the features of claim 1.

Claim 1 is allowable, since Quinn, Nikitin, and Johansen, whether alone or in the combination alleged by the Examiner, do not disclose or suggest all of the elements of claim 1. Independent claims 11, 25, and 26 are allowable for at least similar reasons to the above. Dependent claim 17 recites that the source of electromagnetic radiation and the detector are mechanically fixed to each other. The Examiner appears to point to Johansen for this feature. The electromagnetic radiation and detectors recited in claim 17 cannot correspond to the illumination system 100 and the imaging system 500, respectively, of Johansen because the illumination system 100 and the imaging system 500 are rotated to different angles. Consequently, they cannot be mechanically fixed together.

Dependent claims 2-5, 10, 12, 15, 20, 23, 24, and 27-30 recite further distinguishing features over the applied documents and are also patentable by virtue of depending from independent claim 1, 11, 25, and 26 and on their own merits. The foregoing discussion of the patentability of independent claims 1, 11, 25, and 26 is sufficiently clear such that it is believed to be unnecessary to demonstrate the additional patentable features of the dependent claims other than those discussed above. However, Applicant reserves the right to do so should it become appropriate.

Conclusion

All rejections raised in the Office Action have been addressed. It is respectfully submitted that the application is in condition for allowance and a Notice thereof is respectfully solicited.

Should any questions arise in connection with this application or should the Examiner believe that a telephone conference with the undersigned would be helpful in resolving any remaining issues pertaining to this application, the undersigned respectfully requests that he be contacted at the number indicated below.

Respectfully submitted,

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